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| EXAMINER |
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JOLLEY, KIRSTEN

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| ART UNIT | PAPER NUMBER |
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1762

DATE MAILED: 08/14/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/748,457

Applicant(s)

NGUYEN, ANDREW

Examiner

Kirsten C. Jolley

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 05 June 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 16-31 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 18, 19 and 22 is/are allowed.
- 6) ☒ Claim(s) 16, 17, 20, 21 and 23-31 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 29 December 2003 and 01 June 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Arguments

1. The 35 USC 112, 2nd paragraph rejections have been withdrawn in response to Applicant's amendment to claim 26.
2. Applicant's arguments filed June 5, 2006, with respect to the rejections of claims 16-17, 20-21, and 23-31 under 35 USC 102(b) and 103(a) over Batchelder have been fully considered and are persuasive that Batchelder does not teach that the entire *chamber* is saturated with solvent vapor-carrier mixture; instead Batchelder teaches use of saturated solvent vapor-carrier mixture locally between the substrate and showerhead. Therefore, the rejections have been withdrawn. However, upon further consideration, a new ground(s) of rejection is made over Hasebe et al. alone, and over Hasebe et al. in view of Batchelder as set forth below.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 16, 25-26, and 28-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hasebe et al. (US 5,658,615).

Hasebe et al. discloses a method for coating a surface of a substrate with a polymer (photoresist) solution comprising: securing a substrate to be coated in a coating chamber having

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a rotatable chuck; generating a carrier-solvent vapor mixture, whereby air is the carrier, and air is mixed with evaporated solvent vapor in the closed chamber from the solvent reservoir channel 31f to form the carrier-solvent vapor mixture; saturating the coating chamber with the carrier-solvent vapor mixture; dispensing the polymer solution over a surface of the substrate while the coating chamber is saturated with the carrier-solvent vapor mixture; and rotating the substrate to spread the polymer solution over the surface of the substrate (col. 13, line 48 to col. 14, line 61, and Figure 18). Hasebe et al. does not specifically teach a step of removing excess solvent that did not get transformed into the solvent vapor. However it is the Examiner's position that it would have been obvious for an engineer having ordinary skill in the art to have removed excess solvent still in solvent reservoir 31f, after processing has been completed, during cleaning the processing equipment. Excess solvent is necessarily prevented from dropping on the substrate by design of Hasebe et al.'s solvent reservoir channel. Further, as to claim 25, it is the Examiner's position that it would have been obvious to have directed the excess solvent removed from the coating chamber during cleaning into a container because containers are conventional collection means.

As to claim 26, Hasebe et al. teaches coupling a polymer solution source to the polymer dispenser.

5. Claims 16, 20-21, and 23-31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hasebe et al. (US 5,658,615) in view of Batchelder (US 5,472,502).

Hasebe et al. discloses a method for coating a surface of a substrate with a polymer (photoresist) solution comprising: securing a substrate to be coated in a coating chamber having

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a rotatable chuck; generating a carrier-solvent vapor mixture and saturating the coating chamber with the carrier-solvent vapor mixture; dispensing the polymer solution over a surface of the substrate while the coating chamber is saturated with the carrier-solvent vapor mixture; and rotating the substrate to spread the polymer solution over the surface of the substrate (col. 13, line 48 to col. 14, line 61, and Figure 18). Hasebe et al. teaches in col. 14, lines 55-61 that a mist of solvent in saturation state may be introduced to the enclosed chamber space using, e.g., an inlet pipe (in place of solvent reservoir channel 31f), to realize the solvent atmosphere inside the enclosed space 35. One having ordinary skill in the art would have been motivated to look to the prior art for teachings of conventional methods/apparatus for introducing a mist of solvent in saturation state into an enclosed chamber space in spin coating operations. Batchelder discloses such a process.

Batchelder discloses a method for spin coating a surface of a substrate with a polymeric photoresist solution comprising generating a carrier-solvent vapor mixture and dispensing the coating solution over a surface of the substrate while the local airspace adjacent the substrate is saturated with the carrier-solvent vapor mixture. It would have been obvious to have combined the process and apparatus for providing a carrier-solvent vapor mixture with the process of Hasebe et al. where the atmosphere of the entire chamber is saturated with solvent vapor because Hasebe et al. is not limiting with respect to means for introducing solvent vapor into a saturated chamber to achieve the results of improved thickness uniformity, and because it is well known to maintain an atmosphere of solvent vapor in an entire chamber as evidenced by Hasebe et al. The test of obviousness is not express suggestion of the claimed invention in any or all references but rather what the references taken collectively would suggest to those of ordinary skill in the art

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presumed to be familiar with them. *In re Rosselet*, 347 F.2d 847, 146 USPQ 183 (CCPA 1965); *In re Hedges*, 783 F.2d 1038.

It is the Examiner's position that, while not explicitly taught by Batchelder, the process of Batchelder removes excess solvent that does not get transformed into the solvent vapor by showerhead 312, to prevent the excess solvent from dropping on the substrate. Batchelder teaches that showerhead 312 has perforations 404 through which solvent vapor is dispersed, the perforations having a diameter of 0.002 inches and spaced one-half inch apart (col. 4, line 65 to col. 5, line 2). The Examiner notes that the size of perforations 404 in showerhead 312 are so small that only vapor could fit through, not drops of liquid solvent. Therefore use of showerhead 312 would prevent excess solvent that does not get transformed into solvent vapor from dropping onto the substrate. Further, the excess liquid solvent would necessarily be removed at some point after processing is completed and during cleaning of the equipment. It is particularly noted that when using the showerhead 312C of Figure 10, the excess liquid solvent remaining in filter 1006 would be removed after processing is completed and when the equipment is cleaned and/or the filter replaced.

Batchelder discloses generating carrier-solvent vapor mixture in processes which meet the limitations of claims 23 and 24, particularly the vapor distributor/showerhead 312C of Figure 10. As to claim 31, it is noted that in the embodiment of Figure 10/showerhead 312C, excess solvent is atomized.

As to claim 26, it is noted that the polymer solution source is coupled to the dispenser for the polymer solution, and to the vapor mixture dispenser (see Figure 3).

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With respect to claim 21, Batchelder does not teach showerhead openings in the claimed range. It is the Examiner's position that it would have been obvious to one having ordinary skill in the art to have selected the showerhead opening sizes through routine experimentation depending upon the particular solvent mixture used, and the placement and amount of solvent vapor desired, in the absence of a showing of criticality.

As to claims 25 and 27, it would have been obvious to one having ordinary skill in the art to have directed the excess liquid solvent from Batchelder's process into a container because if the liquid solvent is not kept in a container, it would evaporate and pose harm to the operators' health.

6. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hasebe et al. in view of Batchelder as applied to claim 16 above, and further in view of Gurer et al. (US 6,027,760).

Hasebe et al. in view of Batchelder lack the teaching of detecting the solvent level within the coating chamber. Gurer et al. similarly discloses a spin coating method performed in an atmosphere of saturated solvent of the coating solution. Gurer et al. teaches that it is advantageous to constantly monitor the vapor concentration above the surface of a wafer because it provides a far higher level of precision to the control of the solvent vapor at the wafer surface and the coating process in general. It would have been obvious to have incorporated a solvent level detector in the process of Hasebe et al. taken in view of Batchelder in order to provide constant monitoring and precise control of solvent evaporation and thickness uniformity in the

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process. Gurer et al. teaches that the sensor can be any sensor capable of providing its function (col. 3, lines 54-55).

Allowable Subject Matter

7. Claims 18-19 and 22 are allowed for the reasons discussed in the prior Office action.

Conclusion


8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Hasebe et al. (US 6,228,561) is additionally cited to demonstrate the conventionality of performing spin coating of photoresist solution in a saturated solvent atmosphere (col. 7, lines 26-47).

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kirsten C. Jolley whose telephone number is 571-272-1421. The examiner can normally be reached on Monday to Wednesday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Timothy Meeks can be reached on 571-272-1423. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.


Kirsten C Jolley
Primary Examiner
Art Unit 1762

kcj